Evaluating FV3 Model for Convection-Permitting Forecasting over CONUS in the 2017 Hazardous Weather Testbed Spring Experiment and Hydrometeorology Testbed FFaIR Experiment

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With the selection of the Finite Volume Cubed-Sphere (FV3) dynamical core as the replacement for the GFS dynamical core, work has begun to enhance and evaluate FV3 for potential use as a unified model for forecasting across all scales by the National Weather Service. As the first step of implementing and evaluating physics packages that are more suitable for convective-scale forecasting, the Center for Analysis and Prediction of Storms (CAPS) implemented the latest version of Thompson microphysics scheme within FV3 and ran the model during the 2017 Hazardous Weather Testbed (HWT) spring Experimental Forecast Program (EFP) and the 2017 Hydrometeorology Testbed (HMT) Flash Flood and Intense Rainfall (FFaIR Experiment) periods with a convection-permitting 3-km grid covering the continental US (CONUS), nested within a global grid. Meanwhile, GFDL ran another version of FV3 that differs from that of CAPS in the use of a single-moment microphysics implemented by GFDL.

FV3 was configured as a global model with a stretching grid providing higher resolutions over CONUS; the mean grid spacing over the globe is about 13 km. The 3-km CONUS grid was two-way nested within the global grid and run simultaneously. Forecasts were run every day of the 2017 HWT EFP (Monday through Friday, 1 May through 2 June; 25 cases) and for 20 days (June 19-30, and July 10-21) of the HMT FFaIR experiment, and were initialized from the operational T1534 GFS analysis at 00Z each day and run for 120 hours. The CAPS FV3 forecasts are evaluated using neighborhood-based and object-based forecast evaluation metrics for hourly accumulated precipitation and instantaneous reflectivity. They are also compared with those of the GFDL forecasts, and with the control member of the 3-km CAPS Storm Scale Ensemble Forecasts (SSEF) that employed the WRF ARW model with Thompson microphysics. In addition to precipitation forecasting, other aspects including the prediction of updraft helicity, dryline position, and boundary layer structures will also be examined. Preliminary evaluations indicate that the precipitation and reflectivity forecasts are generally comparable with forecasts of other convection-permitting models presented at HWT and HMT, although there are also aspects that require improvement. Detailed results will be reported at the workshop.